 **UNIVERSITY OF MAINE AT FARMINGTON**

**COLLEGE OF EDUCATION, HEALTH AND REHABILITATION**

**LESSON PLAN FORMAT**

**Teacher’s Name:** Ms. Libby **Lesson #:** 3 **Facet:** Interpretation  
**Grade Level:** 9th Grade **Numbers of Days:** 2-3 Days  
**Topic:** Linear Equations  
  
**PART I:**  
**Objectives**  
Students will understand that graphing two formula functions can allow for finding approximate solutions to the equation  
Students will know inequalities, equation, slop-intercept, linear equations.   
Students will be able to document that graphing two formula functions can allow for finding approximate solutions to the equations.  
**Product:** Sketchfu  
  
**Maine Learning Results (MLR) or Common Core State Standards (CCSS) Alignment**  
Math Common Core State Standards  
Content Area: Algebra  
Grade: High School  
Domain: Reasoning with Equations and Inequalities  
Cluster: Solve systems of equations  
Standard:  
#6 Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
#7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.  
  
**Rationale:**  
Students will meet standard seven by graphing linear equations using real world examples and solving them using graphic organizers to synthesis their data. They will be graphing linear equations using type II technology and interpreting their data in front of the class in a presentation.  
  
**Assessments**  
**Formative (Assessment for Learning)**  
**Section I – checking for understanding during instruction**  
The teacher will split the students into groups and play the game Slap-it where the teams will work together to find the correct answers to problems posed by the teacher. Once the groups think they have found the correct answer, they will slap the correct answer that is posted on the board.  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will self-assess and have their peers assess the day before the presentation. They will have class time to present their graphs to partners and assess each other’s. Students will be given the chance to finalize and fix their presentation using the peer feedback. The students will also fill out a self-assess rubric when they present their graphs to their partners. I will give feedback using the same rubric when they present their finalized graphs to the class.  
  
**Summative (Assessment of Learning):**  
Sketchfu (50 points) Students will have to create a picture by using linear equations. All of the lines must connect so that there is an empty space in the middle of the picture. By having all of the equations surrounding the picture, the students must find the area inside the picture. The students will create their picture on Sketchfu and must include how they found the equation of each line and how they were able to find the area in the picture. The student will present their sketch in front of the class and have it play while they present their answer.   
  
**Integration**  
**Technology:**  
Students will have to take formula functions and graph them using sketchfu and then present their process of graphing with the class while it plays along.  
**Content Areas:**  
**Art:** Students will be able to create their own formulas functions and will have to sketch them using sketchfu.  
**English:** Students will have to write on their graphic organizers and will have to write the formula functions when creating their graphs.  
  
**Groupings**  
**Section I - Graphic Organizer & Cooperative Learning used during instruction**  
Students will be using Story Map 3 to keep their working steps spread out for easier review later on and to easily search for errors. Rally Robin will have students answer the question in teams using the story map to collaborate their answers together.  
**Section II – Groups and Roles for Product**  
Students will work on their sketchfu individually but will present them to the class. The class will watch the graphs play while the student presents their formula functions. The students will be given class time on the day before presentations to practice their presentations. They will share their graph with a partner and see if they need to fix or finalize parts of the graph and presentation.  
  
**Differentiated Instruction**  
**MI Strategies**  
**Verbal:** The students will be working in teams in a competition against the class. The teacher will verbally say the problem and the answers and the students will talk through their thinking within the group and go up to the board and slap the correct answer.  
**Logic:** The students will have story map 3 to help them organize their thinking.  
**Visual:** The problem and the multiple choices for answers will be up on the board for the students as a constant reminder. There will be multiple visual pictures that will show the slope and linear equation that relates to the object in the picture. This will also help English Language Learners because they will have a visual and be able to understand what is being said in the picture and how to get the equations relative to it.   
**Musical:** There will be a musical timer that will play in the background while students collaborate. This will help the students that learn with the musical intelligence, focus on what they are doing and not get distracted by other outside noises.  
**Kinesthetic:** The students will have to run from their group to the board and quickly slap the correct answer before the other team does. This allows students to stay active and continue to move while working through the problems.  
**Intrapersonal:** The teacher will give students problems to work on by themselves before they play slap it.  
**Interpersonal:** Once the teacher thinks that every student understands the concept enough, the students will get split into two teams and play slap it.  
**Naturalist:** The problems that the students will be working on will have variables relative to nature. Instead of having 'X' there will be 'Q' for quartz. There will be a key on the side of every problem so they remember what rock goes to what variable letter.  
  
**Modifications/Accommodations**  
***From IEP’s ( Individual Education Plan), 504’s, ELLIDEP (English Language Learning Instructional Delivery Education Plan)****I will review student’s IEP, 504 or ELLIDEP and make appropriate modifications and accommodations.*  
  
**Plan for accommodating absent students:**  
Students will have a Skype buddy that was assigned at the beginning of the year and they will Skype into class if a computer is available to them. Students that miss the lesson will have an absent folder with the graphic organizer that their fellow classmates have completed. Students will still have to complete the graphic organizer with the teacher either after school or during the teacher’s office hours. The student will still have to create a sketchfu on the formula function that the student and teacher decide on. The student will get started on the project while meeting with the student so that they are fully caught up with their classmates and can complete the project later at home.   
  
**Extensions**  
**Type II technology:**  
Students will be using sketchfu to draw a graph of their formula function. The students will be able to use their graphic organizer as a study guide when creating their graph. Students will then have to present their graph to the class. The graph will play the whole process as the student explains their graph while it is playing.  
**Gifted Students:**  
Gifted students will have to find a sketch of someone else graphing a formula function. Preferable the students should find a mathematician to follow. They will have to present this graph to the class and explain the steps in detail as the graph plays for the class. This way the students have to think critically about the steps that other people took when creating the graph.  
  
**Materials, Resources and Technology**  
Laptops  
Graphic Organizer (Story Map 3)  
White Board  
White Board Markers  
Graphing Paper  
Calculators  
  
**Source for Lesson Plan and Research**  
**Math Rap (Hook):**  
[http://www.youtube.com/watch?v=yyMuppKITis](http://www.youtube.com/watch?v=yyMuppKITis" \t "_blank) - This provides the YouTube link where the math rap is located. This rap will play at the beginning of class to engage the students.  
**Math Vocabulary/Definitions:**  
[http://www.crctlessons.com/math-vocabulary.html](http://www.crctlessons.com/math-vocabulary.html" \t "_blank) - This is where all the mathematical definitions the students will need are located for easy access.   
**Web 2.0 Tools/Sketchfu:**  
<http://cooltoolsforschools.wikispaces.com/Drawing+Tools>- This is where all the Web 2.0 tools are located when a teacher is looking to use type II technology in their classroom. This is also where the sketchfu tool is located.  
**Graphic Organizer (Story Map 3):**  
<http://www.eduplace.com/graphicorganizer/pdf/storymap3.pdf> - This is where the graphic organizer that will be used is located.  
**Cooperative Learning (Rally Robin):**  
[http://edu221resources.wikispaces.com/file/view/cooperative\_learning\_strategies.pdf/373762896/cooperative\_learning\_strategies.pdf](http://edu221resources.wikispaces.com/file/view/cooperative_learning_strategies.pdf/426402320/cooperative_learning_strategies.pdf) - This is where the Cooperative Learning strategies are located for easy access.  
**Checking for Understanding (Slap it):**  
<http://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf> - This is where the CFU's are located and where the checking for understanding strategy slap it is located.  
  
**PART II:**  
**Teaching and Learning Sequence** **(Describe the teaching and learning process using all of the information from part I of the lesson plan)** Take all the components and synthesize into a script of what you are doing as the teacher and what the learners are doing throughout the lesson. Need to use all the WHERETO’s. (3-5 pages)  
  
Classroom Arrangement: Students desks will be an oval at the back of the classroom. This way, the opening of the oval is facing the white board and the projector.  
  
**Agenda:**  
*Day one (80 minutes):*

* Beginning of class overview (2 minutes)
  + Introduction to new lesson (2 minutes)
* Hook (2 minutes)
  + Show only the first two minutes of the rap
  + Take attendance while class is watching math rap
  + Talk about the real world examples that were pointed out in the video.
* Go over graphic organizer/ Story Map 3 (15 minutes)
  + Go over real world examples with class and have them fill out graphic organizer while going along
  + Go over real world examples on graphing with class (10 - 15 minutes)
  + Have class work in partners to graph problems written on the white board (10 minutes)
* Go over lesson product (25 - 30 minutes)Q+A about presentation (remainder of class)
  + Show example of a sketchfu (10 minutes)
  + Go over presentation process (15 - 20 minutes)
    - Show an example of a good presentation (10 minutes)
    - Show an example of a bad presentation (5 - 10 minutes)

Task: Being Sketchfu product

*Day Two (80 minutes):*

* Class discussion on math in the real world (15 minutes)
  + Ask class how they used math since the last class.
* Rally Robin (25 minutes)
  + Teacher asks a real world problem to the class
  + Students must collaborate in their groups and respond to the question orally
* Transition to new game. (3 minutes)
  + Split class into different groups
* Slap it (20 minutes)
  + Student teams will have to answer real world problems
  + When a team gets the answer, they must go up and slap the correct answer on the board.
  + Board must have multiple answers, some wrong and the correct answer so the students must do all the work.
* Peer Feedback (17 minutes - remainder of class)
  + Students will split into partners and will share their graph to their partner.
  + Their partner will assess their graph using a checklist.
  + Each student wills also self-asses their presentation using the rubric given at the beginning of lesson.

Task: Using the peer feedback and self-assessment, fix up and finalize graphs on sketchfu.

*Day Three (80 minutes)*:

* Go over order of presentations (10 minutes)
  + Have a pre-assigned of when the students are presenting
* Q+A/ Last minute touches (10 minutes)
  + If students have any last minute questions about their product or presentation
  + Other students prepare for presentation and do last minute touches
* Presentations (60 minutes)
  + Each student will present (5 minutes each)

The classroom will be arranged in a half oval so that when students present their sketchfu, they will be able to talk to all students and everyone will be able to see the presenter. Students will understand that graphing two formula functions can allow for finding approximate solutions to the equation. If students ever want to proceed in a career in construction, they will need to create a floor plan for whatever building they will be constructing. They will have to figure out the dimensions of all the sides and even the ones they have to imagine that are not drawn. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. The students will enter a class and a [math rap](http://www.youtube.com/watch?v=yyMuppKITis" \t "_blank) will be playing while they are getting seated and taking out their materials for the lesson.  
**Where, Why , What, Hook, Tailors:** *Logical, Naturalist, Visual, Musical.*   
  
Students will know inequalities, equation, slop-intercept, linear equations. (See content notes for definitions) Students will be using Story Map 3 to keep their working steps spread out for easier review later on and to easily search for errors. I will go over the graphic organizer with the whole class using examples that I break down on the white board. This way, every student is using the same example and will have all the steps. While I am working through the example, I will ask for student input to see if they can answer on how to solve the specific example. This will ensure that the students are not just copying down what I am writing but are also thinking the problem through as well. I will have the students play Rally Robin. Students will be split into groups and I will pose a question or problem to all the groups. The groups will collaborate together using the graphic organizer to help them solve the problem or question. Once a team has the answer, they will orally communicate the answer to me. After Rally Robin, then I will split the class into different groups so that they have a chance to move around a stretch their muscles. These new groups will than play slap it. These teams will work together to find the correct answers to problems posed by me. I will use real world examples and show pictures of various objects and landscape pictures. The students will have to find the slope of the line of the objects/landscape. This will help the students relate linear equations to real world examples. Once the groups think they have found the correct answer, they will slap the correct answer that is posted on the board.   
**Equip, Explore, Rethink, Tailors:** *Logical, Kinesthetic, Intrapersonal, Interpersonal, Visual.*  
  
Students will be able to document that graphing two formula functions can allow for finding approximate solutions to the equations. Students will be using Story Map 3 to keep their working steps spread out for easier review later on and to easily search for errors. This will allow them to record the breakdown of a problem step by step. They can also record notes or extra solution techniques on the graphic organizer. This will let the students be able to write down what they think is necessary to know late on when studying. Some students may need extra notes where others may just write the formulas. They have the ability to write what they want on the graphic organizer that will help them in the future. I will have pre-assigned groups before class. This will allow me to organizer the groups with people that work well together and have similar multiple intelligences. This will enhance the activity for each student and keep the class motivated and engaged. Rally Robin will have students answer the question in teams using the story map to collaborate their answers together. I will have the teams answer a question or problem that I pose. They will have to answer the questions orally. This will allow me to correct the teams that might get the answer wrong and have the other teams hear as to why it is wrong. The teams that get the correct answer can communicate to the other teams the correct answer and why it is correct. It involves the whole class and it is small group collaboration to keep up with the classroom management. Students will have to take formula functions and graph them using sketchfu and then present their process of graphing with the class while it plays along. This will make the students think critically when they have to actually graph the formula functions. They can use the graphic organizer in class as a guide but will have to come up with their own examples different from the ones covered in class. Students will have to present their sketchfu graphs to class and explain to the class the steps they took to solve and graph the formula functions they chose. This will allow me to give immediate feedback and allow the students to see their peers graphs and compare.  
**Explore, Experience, Revise, Refine, Tailors:** *Logical, Visual, Intrapersonal, Interpersonal.*  
  
Students will self-assess and have their peers assess the day before the presentation. They will have class time to present their graphs to partners and assess each other’s. Students will be given the chance to finalize and fix their presentation using the peer feedback. The students will also fill out a self-assess rubric when they present their graphs to their partners. I will give feedback using the same rubric when they present their finalized graphs to the class.  
**Evaluate, Tailors:** *Logical, Intrapersonal, Interpersonal.*

**Content Notes**  
Students will know…..  
*Vocabulary Definitions:*

* Inequalities
* Linear Equation
* Equation
* Slope-intercept Form

Inequality:  
An inequality is a mathematical sentence that compares two quantities that do not equal each other. There are a two main ways to compare quantities:  
> (Greater than)  
< (Less than)  
An example of this is 2 + 3 < 97 – 82 This is saying that 2 + 3 is less than 97 - 82  
To check that this is true, you solve both sides separately which will make this 5 < 15 which saying that 5 is less than 15 which is correct  
Linear Equation:  
A linear equation is an equation whose graph is a straight line in the coordinate plane. The equation can be written like y = 2x -3 This was written using the slope-intercept formula which is defined below.  
Equation:  
An equation is a mathematical sentence that indicates that two number or mathematical expressions are equal. An example of this is 3x - 4 = 19. The equal sign shows that the expression on the left side (3x- - 4) of the equation is equal to the ride side (19) of the equation.  
Slope – Intercept Form:  
The slope - intercept form of a linear equation is given by the following formula: y= mx + b ;(where ‘m’ is the slope and ‘b’ is the y – intercept)  
Slope is a ratio use to measure the steepness of a line. To find slope you must find the change in ‘y’ over the change in ‘x’. This can also be written as: Rise/Run  
The way to find rise/run is to have to points on a line. For example (1,2) and (3,4); to find the ‘rise’ you find the difference between the y coordinates. So; 4 – 2 = 2 then you do the same thing for the x coordinates to find the ‘run’. So; 3 -1 = 2 this will make the final answer be 2/2 which is 1 so the slope is 1.  
  
**Handouts**  
Story Map 3  
Rubric for Presentation  
Graphing paper  
  
**Maine Common Core Teaching Standards for Initial Teacher Certification and Rationale**  
*Standard 1 – Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.*  
  
***Learning Styles***  
***Clipboard:*** The expectations for the class are clearly posted inside the classroom and on the class website. It covers everything that is expected and nothing is left to interpretation unless otherwise discussed with me. Students will be given the rubric that has clear expectations as to how to complete the presentation and what is expected when giving the presentation to the class. They will also be given a graphic organizer that breaks down every step to solving linear equations.  
***Microscope:*** There will be graphic organizers for every part of the unit so students will be able to write down their learning process. There will be checking for understanding throughout the lessons so students will always know if they are retaining the correct information or not. Class collaboration will allow the students to work together and constantly think deeper into the subject.  
***Puppy:*** Students will be seated in a half oval so they will also have a fellow classmate on both sides of them to help with any questions. The students will also be split into groups and have group collaboration so that if one student does not understand something, their team members can explain the concept to that student so that every member of the team grasps the specific concept.   
Classroom expectations will be posted inside the classroom to create a helping and respectful environment for everyone.  
***Beach Ball:*** Students will be creating their own sketchfu where they get to present it to the class in a way that works for them. They will get to create the formula function they want to solve and graph. This gives them the freedom to complete the lesson product in an individualized way.   
***Rationale:*** This lesson meets the standard because I know different strategies to appeal to all kind of learning styles. Students will have multiple opportunities to prove their understanding to further their knowledge in the unit. This lesson requires students to think critically in order to solve the equations but they will have the freedom to choose what equations to solve and the liberty to come up with their own equations.   
  
*Standard 6 - Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their on growth, to monitor learner progress, and to guide the teacher's and learner's decision making.*  
  
*Formative:*  
**Section I – checking for understanding during instruction**  
The teacher will split the students into groups and play the game Slap-it where the teams will work together to find the correct answers to problems posed by the teacher. Once the groups think they have found the correct answer, they will slap the correct answer that is posted on the board.  
**Section II – timely feedback for products (self, peer, teacher)**  
Other groups will respond and give feedback to the groups in case they believe any errors were made and give tips on ways to revise and get the correct answer. The students will then fill out a self-assess rubric that says what they did wrong, why they got it wrong and how they corrected their answers. The teacher will also give feedback to the groups if the student feedback is not helpful enough. This way the groups are all receiving the correct answer at the end of the lesson.  
  
*Summative:*  
Sketchfu (50 points) Students will have to create a picture by using linear equations. All of the lines must connect so that there is an empty space in the middle of the picture. By having all of the equations surrounding the picture, the students must find the area inside the picture. The students will create their picture on Sketchfu and must include how they found the equation of each line and how they were able to find the area in the picture. The student will present their sketch in front of the class and have it play while they present their answer.   
  
***Rationale:***  
This will let me know where the students are in terms of mastery and understanding of the content being taught. I will use this information in planning future lessons and to strengthen my teaching style and technique so that all students benefit from my lessons. Formative assessments will be used multiple times in my lessons so that I will constantly have an idea of where my students are in their learning. 

*Standard 7 - Planning Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.*  
  
*Content Knowledge:*  
Students will know inequalities, equation, slop-intercept, linear equations.  
  
*MLR or CCSS:*  
Math Common Core State Standards  
Content Area: Algebra  
Grade: High School  
Domain: Reasoning with Equations and Inequalities  
Cluster: Solve systems of equations  
Standard:  
#6 Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
#7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.  
Facet: Interpretation  
  
*Rationale:*  
Students will meet standard seven by creating equations using real world examples and solving them using graphic organizers to synthesis their data.  
  
*Standard 8 - Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.*  
  
*MI Strategies:*  
**Verbal:** The students will be working in teams in a competition against the class. The teacher will verbally say the problem and the answers and the students will talk through their thinking within the group and go up to the board and slap the correct answer.  
**Logic:** The students will have story map 3 to help them organize their thinking.  
**Visual:** The problem and the multiple choices for answers will be up on the board for the students as a constant reminder. There will be multiple visual pictures that will show the slope and linear equation that relates to the object in the picture. This will also help English Language Learners because they will have a visual and be able to understand what is being said in the picture and how to get the equations relative to it.  
**Musical:** There will be a musical timer that will play in the background while students collaborate. This will help the students that learn with the musical intelligence, focus on what they are doing and not get distracted by other outside noises.  
**Kinesthetic:** The students will have to run from their group to the board and quickly slap the correct answer before the other team does. This allows students to stay active and continue to move while working through the problems.  
**Intrapersonal:** The teacher will give students problems to work on by themselves before they play slap it.  
**Interpersonal:** Once the teacher thinks that every student understands the concept enough, the students will get split into two teams and play slap it.  
Naturalist: The problems that the students will be working on will have variables relative to nature. Instead of having 'X' there will be 'Q' for quartz. There will be a key on the side of every problem so they remember what rock goes to what variable letter.  
  
***Type II Technology:***  
Students will be using sketchfu to create their own linear equation that they will graph. They will solve these equations and graph what the equation would look like. They will have to present these graphs to the class. Sketchfu allows you draw a graph and play it like a video so you can see every step that was taken. This can also be helpful in case a student draws a graph wrong. It will play the video and you can see where the student went wrong and prompt them on how to fix the mistake.  
  
***Rationale:***  
This lesson incorporates multiple intelligences to ensure that each student is getting the most out of my unit. This helps so that the students all have an equal opportunity to learn the way they learn best. It ensures that every student is included and engaged in the lesson being taught. I want all students to understand their learning style better so that later on in other classes, they can take this knowledge with them to further their learning.  
  
NETS STANDARDS FOR TEACHERS  
1. Facilitates and Inspire Student Learning and Creativity. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.  
a. Promote, support, and model creative and innovative thinking and inventiveness  
  
b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources  
  
c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes  
  
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments  
  
***Rationale:***  
Students will have to think critically to fill out their story map 3. I will be going over the graphic organizer with the class so that every student has the same information on the graphic organizer. This will allow it to be easier to study when the students are out of class and will allow easier group collaboration. Students will get to see the math rap play at the beginning of class. The rap will give multiple examples of how math can be used in the real world. This will deliver the message of how important math is in a way that appeals to the students and their generation.  
  
2. Design and Develop Digital Age Learning Experiences and Assessments. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop knowledge, skills, and attitudes identified in the NETS-S.  
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity  
  
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress  
  
c. Customize and personalize learning activities to address students’ diverse learning styles, working strategies, and abilities using digital tools and resources  
  
d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching  
  
***Rationale:***  
Students will be using sketchfu to help them virtually graph formula functions using examples that they create. This will give the students multiple opportunities to prove whether they understand the concept or not and to what extent. This type II technology will allow the students to see their fellow peer’s graphs and get to see them virtually create it and see every step that was taken. Through formative and summative assessments, students will have multiple opportunities to prove whether the understand the content, to what extent, and what they need help on understanding. Students will each have the opportunity to learn according to their learning style and their multiple intelligences.